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**APPLICATION FOR LETTERS PATENT**

**SYSTEMS AND METHODS FOR EDITING XML  
DOCUMENTS**

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## **CROSS REFERENCE TO RELATED PATENT APPLICATION**

United States Patent Application having serial no. 10/395,505, a filing date of 3/24/2003, and an attorney's docket number of MS1-1343US, for SYSTEM AND METHOD FOR DESIGNING ELECTRONIC FORMS AND HIERARCHICAL SCHEMAS of Paoli, et al is related to this application.

## **TECHNICAL FIELD**

This invention relates to systems and methods for editing an eXtensible Markup Language (XML) document.

## **BACKGROUND**

XML is increasingly becoming the preferred format for transferring information. XML is a tag-based hierarchical language that is extremely rich in terms of the information that it can be used to represent. For example, XML can be used to represent information spanning the spectrum from semi-structured information (such as one would find in a word processing document) to highly structured information (such as that which is contained in a table). XML is well-suited for many types of communication including business-to-business and client-to-server communication. For more information on XML, XSLT, and XML Schema, the reader is referred to the following documents which are the work of, and available from the W3C (World Wide Web consortium): XML 1.0 second edition specification; XSL Transformations (XSLT) Version 1.0; XML Schema section 1: Structures; and XML Schema section 2: Datatypes.

Before information can be transferred, however, it must first be collected. Electronic forms are commonly used to aid in collecting information into an XML

1 document. Electronic forms can be governed by a template, which can provide  
2 rules by which an XML document can be presented as an electronic form, such as  
3 with data-entry fields for entry of data.

4 To create these templates, however, a programmer often needs a significant  
5 understanding of HTML and XML Schemas. A programmer often needs to  
6 understand how data-entry fields in an electronic form governed by the template  
7 are represented in the schema, HTML file, and XML document. The programmer  
8 also may need to understand how HTML, XML, and XML Schemas are structured  
9 and how they interrelate. Thus, to build a template, a programmer often must have  
10 significant experience and skill.

11 In addition, to use the template, a programmer may need to build a program  
12 to allow a user to edit an XML document governed by this template.

13 For these reasons, creating and using templates can be difficult, time  
14 consuming, and require a programmer of significant skill.

## 15 16 **SUMMARY**

17 In the following description and figures, an editing application is described  
18 that is capable of identifying nodes of an XML document that are editable and  
19 operations permitted for those nodes using elements of an electronic-form  
20 template.

21 In one implementation, the editing application presents an XML document  
22 as an electronic form having data-entry fields representing nodes of the XML  
23 document. The editing application presents those nodes that are identified as  
24 editable in a parent element in another XML document governing the first XML  
25 document. The editing application enables certain operations for those editable

1 nodes through the data-entry fields if a child element of the parent element  
2 identifies them.

### 3 4 **BRIEF DESCRIPTION OF THE DRAWINGS**

5 Fig. 1 illustrates a system with a display screen, computer, and user-input  
6 devices. The system implements a method for designing an electronic-form  
7 template. The system also implements a method for editing XML documents  
8 using an electronic-form template.

9 Fig. 2 illustrates an exemplary screen display showing a hierarchical view  
10 and a design view of an electronic-form template.

11 Fig. 3 illustrates an exemplary component display area.

12 Fig. 4 is a flow diagram of an exemplary process for generating electronic-  
13 form templates.

14 Fig. 5 illustrates an exemplary screen display showing a component display  
15 area and a blank form-design area.

16 Fig. 6 illustrates an exemplary screen display showing a hierarchical view  
17 and a design view of an electronic-form template, and a component display area.

18 Fig. 7 illustrates the exemplary screen display of Fig. 6 after the electronic-  
19 form template comprises another component.

20 Fig. 8 illustrates the exemplary screen display of Fig. 7 after the electronic-  
21 form template comprises other components.

22 Fig. 9 illustrates the exemplary screen display of Fig. 8 showing also a  
23 component context menu and a structure submenu.

24 Fig. 10 illustrates an exemplary hierarchical view display area, a change  
25 inquiry window, and an add window.

1 Fig. 11 is a flow diagram of an exemplary process for editing an XML  
2 document using an electronic-form template.

3 Fig. 12 illustrates an exemplary screen display showing an electronic-form  
4 representation of an XML document having one editable node.

5 Fig. 13 illustrates an exemplary screen display showing an electronic-form  
6 representation of an XML document following an electronic-form template.

7 Fig. 14 is a block diagram of a computer system that is capable of  
8 supporting processes for creation and use of an electronic-form template.

9 The same numbers are used throughout the disclosure and figures to  
10 reference like components and features.

## 11 12 **DETAILED DESCRIPTION**

13 The following disclosure describes a user-friendly way to design electronic-  
14 form templates using components and a form-designing area of a display.  
15 Components are presented in an area of a display screen, usually graphically, such  
16 as with an arrangement of icons. Icons representing each component are a  
17 simplification so that a designer can more easily understand the purpose of and  
18 choose from a list of components. A designer can choose each component that he  
19 or she wishes to include in an electronic-form template.

20 The designer can choose a component, such as by clicking on an icon  
21 representing a component, and placing it in a form-designing area. The form-  
22 designing area is presented in an area of a display screen, usually appearing as a  
23 blank page, such as is often done when viewing a new document in a word-  
24 processing application. Components placed in a form-designing area can be  
25 manipulated by a designer to allow the designer to create an electronic-form

1 template that provides a particular look and feel for an electronic-form  
2 representation of an XML document. Also by choosing particular components, a  
3 designer can build into the electronic-form template various types of permitted  
4 operations (e.g., editing operations).

5 With each new component added or modified, and in some cases each  
6 change made to an electronic-form design view or its hierarchical view, the  
7 electronic-form template (and its views) is altered to reflect that change. This  
8 incremental building of an electronic-form template and its views, and the fact that  
9 the views are linked so that a change to one can almost instantly be reflected in the  
10 other, allows a designer to quickly, easily, and intuitively create electronic-form  
11 templates.

12 The resulting electronic-form template reflects a designer's chosen look,  
13 feel, and editing options for nodes of XML documents that are to be governed by  
14 the electronic-form template. Thus, by following this electronic-form template,  
15 nodes of an XML document can be located within the XML document, displayed,  
16 and made editable. In one embodiment, an editor application is used to determine,  
17 based on this electronic-form template, how nodes of an XML document are to be  
18 edited.

19 For discussion purposes, the visual representation of the components,  
20 hierarchical view, electronic-form design view, and XML document are described  
21 in the context of a single computer, a set of user-input devices, and a single  
22 display screen having areas for displaying a representation of the components, the  
23 electronic-form design view, the hierarchical view, and the XML document. The  
24 display screen, computer, and user-input devices will be described first, followed  
25 by a discussion of the techniques in which these and other devices can be used.

## System Architecture

Fig. 1 shows an exemplary implementation of various devices and applications that can be used to facilitate the creation of an electronic-form template from components and enable editing of XML documents governed by the created electronic-form template.

Fig. 1 shows an exemplary system 100, which comprises a screen 102, user-input devices 104, and a computer 106.

The user-input devices 104 can comprise any device allowing a computer to receive a designer's preferences (or edits from an end-user), such as a keyboard 114, other device(s) 116, and a mouse 118. The other input devices 116 can comprise a touch screen, a voice-activated input device, a track ball, and any other device that allows the system 100 to receive input. The computer 106 comprises a processing unit 120 and random access memory and/or read-only memory 122 including applications, such as an operating system 124, a design application 126, a user interface 128, an editor application 130, an electronic-form template 132, and an XML document 134. The computer 106 communicates with a designer and end-user through the screen 102 and the user-input devices 104.

The screen 102 comprises three displays or screen areas: a hierarchical view display area 108; a component display area 110; and an electronic-form-design area 112. With these areas, a designer can see a representation of and select a component from a list of components. Any part or all of the screen 102 can be used to present an electronic-form representation of the XML document 134. With this representation an end-user can edit or view the XML document 134.

1        Fig. 2 shows an exemplary design screen 200, including an example of the  
2 form-design area 112 and the hierarchical view display area 108 (entitled "Data  
3 Source"). Partially within the form-design area 112 is a design view 202 of an  
4 exemplary embodiment of the electronic-form template 132. This design view  
5 202 provides information useful to aid a designer in constructing the electronic-  
6 form template 132. As will be shown later, an electronic-form representation of  
7 the XML document 134 for editing and/or viewing by an end-user (e.g., a data-  
8 entry user) can appear similar to this design view 202 of the electronic-form  
9 template 132, though this is not necessary. In cases where the electronic-form  
10 representation contains data-entry fields and similar user interfaces, these user  
11 interfaces can reflect operations permitted by components added to the electronic-  
12 form template 132 by the designer.

13        This electronic-form template 132 shown in the design view 202 is being  
14 built from components chosen by a designer. The components chosen are used by  
15 the design application 126 to create the data-entry fields shown in the design view  
16 202. These data-entry fields are one way in which the electronic-form template  
17 132 can be represented to a designer or an end-user. These data-entry fields  
18 correspond to parts of the electronic-form template 132, the parts also being  
19 shown through the icons displayed in the hierarchical view display area 108. The  
20 icons displayed are a representation of part of the electronic-form template 132  
21 and are arranged into a tree structure.

22        Fig. 3 shows an example of components from which a designer can choose,  
23 which are displayed here at the component display area 110. These various  
24 components comprise a text box 302, a rich text box 304, a drop-down list box  
25 306, a list box 308, a date picker 310, a check box 312, an option button 314, a



1 section 316, an optional section 318, a repeating section 320, a repeating table  
2 322, a bulleted list 324, a numbered list 326, a plain list 328, a button 330, and  
3 hyperlink 332. Other components can be included as well. As described in further  
4 detail below, each of these components can be added to indicate an operation or  
5 operations that is permitted to be performed on a node or nodes of the XML  
6 document 134. By way of example, some of these components will be represented  
7 in an electronic form by data-entry fields enabling the component's operation.  
8 These data-entry fields can be associated with appropriate nodes of the XML  
9 document 134. Thus, when an end-user uses an electronic form's data-entry field  
10 to make an entry, for instance, the entry can be reflected in the XML document  
11 134.

12 With the listed components and other components the system 100 enables a  
13 designer to build the electronic-form template 132. These components enable  
14 many different possible types of operations (and user interfaces), such as those  
15 shown with various data-entry fields in the design view 202 in the form-design  
16 area 112 of Fig. 2. The process used to build the electronic-form template 132 will  
17 be set forth in greater detail below.

18 The above devices and applications are merely representative, and other  
19 known devices and applications may be substituted for or added to those shown in  
20 Fig. 1. One example of another known device that can be substituted for those  
21 shown in Fig. 1 is the device shown in Fig. 14. Other examples include portable,  
22 handheld, or wireless devices.  
23  
24  
25

## Techniques for Building Electronic-Form Templates

### *Overview*

A system, such as the system 100 of Fig. 1, displays components to a designer. The designer can choose from the components to graphically and easily build the electronic-form template 132. The system 100 can also incrementally build the electronic-form template 132 with each new component the designer adds. The system 100 also allows the designer to see two views of the electronic-form template 132, here the design view 202 and the hierarchical view 204. The system 100 then alters each view with each new component chosen. The designer may also change components existing in the electronic-form template 132, the change to each being incrementally reflected in the views by the system 100.

Fig. 4 shows a process 400 for generating the electronic-form template 132. The process 400 and the following processes are illustrated as a series of blocks representing individual operations or acts performed by the system 100. These processes may be implemented in any suitable hardware, software, firmware, or combination thereof. In the case of software and firmware, the processes represent a set of operations implemented as computer-executable instructions stored in the memory 122 and executable by the processing unit 120.

### *Displaying Components and Form-Design Area*

At block 402, the user interface 128 displays components and a form-design area. It does so to enable a designer to graphically design the electronic-form template 132.

Fig. 5 shows a design screen 500 created by the user interface 128, having an example of the component display area 110 and a blank example of the form-

1 design area 112. The form-design area 112 is displayed to make it easy for a  
2 designer without typical programming skills to create the electronic-form template  
3 132.

4 To make it easy, the user interface 128 can provide an editing experience to  
5 a designer similar to that commonly provided in word-processing systems. The  
6 user interface 128 can, for instance, work like a word-processing system by  
7 providing similar font controls and options. In Fig. 5, for example, the user  
8 interface 128 displays the form-design area 112 looking like a page from a word-  
9 processing application—here, a blank white page. It can also display commonly  
10 used icons that represent operations that a designer can choose to perform, such as  
11 the font being used (in Fig. 5, Verdana, size 10), bold/underline/italic options, and  
12 the like. These word-processing icons can be displayed in many different ways,  
13 including as shown in a word-processing icon display 502 of Fig. 5.

14 Also, as stated elsewhere herein, changes made by the designer to the form-  
15 design area 112 can be reflected in the form-design area 112 instantaneously (from  
16 the perspective of the designer), further making the design process similar to a  
17 typical word-processing experience. By so doing, the user interface 128 makes  
18 designing the electronic-form template 132 simpler and more intuitive for a person  
19 skilled in word-processing.

20 The components are displayed by the user interface 128 in the component  
21 display area 110 to make it easy for a designer without extensive knowledge of  
22 components to be able to understand what each of them can represent in the  
23 electronic-form template 132. To show what each component represents, the user  
24 interface 128 displays icons and/or text to inform the designer, such as with the  
25 icons and text set forth in the component display area 110 set forth in Figs. 3 and

1 5. In Fig. 3, for example, the text box 302 comprises an icon (i.e., a symbol) and  
2 text describing what a text box component represents. This icon shows a designer  
3 that, should he choose to include a text box component in his electronic-form  
4 template 132, an operation allowing entry and editing of text for a node in the  
5 XML document 134 will be added to the electronic-form template 132. The editor  
6 application 130 can then present the node of the XML document 134 in an  
7 electronic form as a data-entry field allowing input of text. Like the icon, the text  
8 describing the text box 302 ("Text Box") is also descriptive.

9 With the component display area 110 and the form-design area 112  
10 displayed, the designer can begin to build the electronic-form template 132 and  
11 view what an electronic-form representation of the XML document 134 can look  
12 like. He can continue to build the electronic-form template 132 by adding  
13 components, but can also alter the electronic-form template 132 by altering  
14 existing components. This process of building and altering is shown as a design  
15 sub-process 403, which includes blocks 404 to 412. The sub-process 403 includes  
16 blocks used to describe the action and interaction of the designer and the system  
17 100. When the designer has finished with the electronic-form template 132, the  
18 design application 126 produces an electronic-form representation mirroring the  
19 operations allowed by the electronic-form template 132 (block 414). The process  
20 403 and the block 414 will be described in greater detail below.

21 When the component display area 110 and the form-design area 112 are  
22 presented, the designer can pick a component from the list of components in the  
23 component display area 110 for insertion into the form-design area 112 (block  
24 404). The designer can pick from components in various ways, including through  
25 the mouse 118, the other devices 116 (such as a touch screen, track ball, voice-

1 activation, and the like), and through the keyboard 114, which are shown in Fig. 1.  
2 To grant flexibility to the designer, the system 100 enables the designer to move  
3 the component in the form-design area 112 to where she desires.

4 A designer can pick a component, for example, by dragging and dropping  
5 (from the component display area 110) a component's icon onto a form-design  
6 area 112 shown in Fig. 5. The designer can pick a component to drag and drop  
7 with various devices, such as with the mouse 118 or commands entered through  
8 the keyboard 114. In Fig. 5, the designer clicks on the icon and text for the text  
9 box 302 to select it.

10 How an icon for a component looks may not exactly indicate how it will  
11 look in an electronic-form representation of the XML document 134 that follows  
12 the electronic-form template 132. Icons, for instance, are often too small to be  
13 exact. Rather, icons are designed to indicate functions or operations (e.g., editing  
14 functions) associated with nodes of the XML document 134 that choosing the  
15 component will permit.

16 Fig. 6 shows an exemplary screen display 600 showing what the design  
17 application 126 creates after a designer selects the text box 302 in Fig. 5 (also  
18 shown in Fig. 6). In this example, the system 100 creates a text-function node 604  
19 allowing entry of text, here represented by the text-box data-entry field 602, which  
20 looks like a gray box for entry of text and is labeled "String 1:". The design  
21 application 126 enables the designer to continue building his electronic-form  
22 template 132 by selecting components, thereby creating certain allowed operations  
23 associated with nodes of the XML document 134. In this example, the design  
24 application 126 created part of the electronic-form template 132 that indicates a  
25 permitted function (here a text-entry function) with the text-function node 604.

## *Building an Electronic-Form Template*

Once the system 100 receives a selection of a component and the placement for the component, the system 100 can identify which component was selected, identify the placement for that component on the form-design area 112, build the electronic-form template 132 based on the component chosen and its location, and display the design view 202 and the hierarchical view 204. These tasks are set forth in blocks 406, 408, 410, and 414 of Fig. 4, which will be described below.

In block 406, the design application 126 identifies which component was selected. The system 100 can access and/or contain many components, either from local or remote sources. Some of these components are set forth (via icons and text) in the component display area 110 shown in Figs. 3, 5, 6, and 7.

Also in the block 406, the design application 126 identifies where a component is placed in the form-design area 112. The placement of the component can alter the structure of the electronic-form template 132. How the placement of a component can alter the electronic-form template 132 will be set forth in greater detail below.

If, for example, a designer chooses the text box 302 from the component display area 110 of Fig. 5, and places the text box 302 in the upper left corner of the form-design area 112, the design application 126 will identify the component and this placement. With this information, the system 100 proceeds to build the electronic-form template 132, which will be described in part using Figs. 5 and 6.

In block 408, the design application 126 changes the electronic-form template 132 based on a component selected. When a component is added, as has been described in part above, the design application 126 also changes the

1 hierarchical view 204 and the design view 202 of the electronic-form template 132  
2 by building in a representation of the added component. When an existing  
3 component is altered (discussed in greater detail below), the design application  
4 126 changes the views to reflect that alteration.

5 Generally, when a component is added to the form-design area 112, one or  
6 more operations are then permitted by the electronic-form template 132. A syntax  
7 (also called a "character string") corresponding to each of these permitted  
8 operations can be added by the design application 126 to the electronic-form  
9 template 132. An exemplary list of operations and their related, operational  
10 syntaxes are shown below:  
11  
12  
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Component Chosen	Operation Permitted	Syntax Added
Repeating Section Repeating Table	Insertion of Nodes Before or After Associated Node, and Removal of Nodes	xCollection
Optional Section	Insert or Remove Nodes	xOptional
Plain List Bulleted List Numbered List	Text Editing of Data Within Associated Node(s), Plus Merge, Split, and Removal of Subordinate Node(s)	xTextList
Rich Text Box Text Box	Text Editing of Data Within Associated Node(s)	xField
Picture	Insertion of Images Into Associated Node(s)	xImage

An operation permitted can govern, for instance, how and what kind of information is permitted to be added into a node or nodes of the XML document 134 that is associated with that operational syntax. The node or nodes of the XML document 134 can be associated with the operational syntax. The operational syntax can be associated with a location syntax, such as an XPath expression.



1 Both the operational syntax and the location syntax can be included within an  
2 XML element added to the electronic-form template 132. XML elements will be  
3 described in greater detail below.

4 Fig. 7 shows an exemplary screen display 700 showing the continued  
5 building of the electronic-form template 132. Here, the designer chose another  
6 component (the check box 312 of Fig. 6) to add to the electronic-form template  
7 132 shown in Fig. 6.

8 In one embodiment, when the designer adds the Rich Text Box component  
9 304 to the form-design area 112, the design application 126 adds the following  
10 XML element to the electronic-form template 132:

```
11  
12 <xf:xmlToEdit name="xhtml1" item="/myFields/xhtml1" >  
13   <xf:editWith type="rich" component="xField" />  
14 </xf:xmlToEdit>
```

15  
16 This XML element is an example of an “editability element”, described below.

17 In response to the designer’s choice, the design application 126 represents  
18 the added editability element as a Rich Text Box 702. As shown in the screen  
19 display 700, the Rich Text Box 702 is labeled “Xhtml 1”. Also in response to the  
20 designer’s choice, the design application 126 altered the hierarchical view 204 to  
21 include an XHTML section 704 (labeled “xhtml1”) corresponding to the Rich  
22 Text Box 702 and the editability element.

23 This editability element comprises XML attributes and additional child  
24 elements. These elements and attributes provide information that the editor  
25 application 130 can use to determine that a node or nodes of the XML document

1 134 are editable. These elements and attributes also provide the editor application  
2 130 with information indicating which operations are permitted for these editable  
3 nodes.

4 Syntax of the editability element indicates a name and/or location in the  
5 XML document 134 of a node or nodes. With this indicator, the editor application  
6 130 can determine which node or nodes are potentially editable with operations  
7 permitted by this editability element. In one implementation, by using all of the  
8 electronic-form template 132, the editor application 130 can determine all nodes in  
9 the XML document 134 that are potentially editable.

10 Continuing the ongoing example, the "xmlToEdit" editability element  
11 includes an attribute having a character string of "item", associated with an  
12 indicator of: "myFields/xhtml1" (the "value" of the attribute). This indicator can  
13 be used to determine that nodes having the name and/or location of  
14 "myFields/xhtml1" are potentially editable. In this example the indicator  
15 comprises an XPath expression being usable to locate node(s) matching this XPath  
16 expression.

17 An additional attribute (a 'container' attribute) can also be included, to  
18 indicate contextual conditions, if any, that should be present for the node to be  
19 deemed editable. In the ongoing example, there is no 'container' attribute. Thus,  
20 in this example, the node indicated by "myFields/xhtml1" is editable without  
21 contextual conditions.

22 Another child XML element, called an "operation element", in the  
23 editability element indicates operations (e.g., editing functions) permitted to be  
24 performed on or with the node(s) indicated in the editability element. In the  
25 ongoing example, the operation element entitled "editWith" indicates that

1 operations associated with "xField" of type "rich" may be applied on or for the  
2 nodes indicated by "myFields/xhtml1".

3 The operation or set of operations indicated by the operation element can be  
4 determined from the syntax given in the operation element. Thus, in the ongoing  
5 example the syntax "xField" with the additional "type" attribute, with 'value  
6 "rich", indicates an operation of rich-text editing, such as deleting and inserting  
7 text, changing the formatting of text, making it bold or italics, and other familiar  
8 rich-text editing operations familiar to word-processing. In this example, then, the  
9 nodes or data within the nodes indicated by "myFields/xhtml1" may be edited  
10 using these operations.

11 The operation element can indicate permitted operations in various  
12 manners. In one implementation, a syntax of the operation element includes an  
13 element specifying the XML data able to be inserted by the associated operations.

14 Thus, the electronic-form template 132 governs how information is handled  
15 and operations permitted for the XML document 134 for which it corresponds.  
16 Because the electronic-form template 132 comprises an editability element and its  
17 parts for each component chosen by the designer, the chosen component affects  
18 the syntax of the electronic-form template 132.

19 With the above syntax and the editability element, each component built  
20 into the electronic-form template 132 can govern the look, display, orientation,  
21 and size of data-entry field(s), as well as how and where information entered into  
22 these data-entry field(s) is mapped, such as to nodes of the XML document 134.  
23 The editor application 130 can, however, use less than all of the electronic-form  
24 template 132. It can, for instance, determine potentially editable nodes and  
25

1 operations permitted, but use a different look, display, orientation, and size of  
2 data-entry fields (or not use data-entry fields at all).

3 Once the system 100 changes the electronic-form template 132 (block 408),  
4 it proceeds to block 410 to display the electronic-form template's 132 design view  
5 202 and hierarchical view 204, or to block 414, to complete the process and  
6 produce the electronic-form template 132. Block 410 will be discussed first  
7 below, followed later by a discussion of block 414.

8 In the block 410, the user interface 128 displays the electronic-form  
9 template's 132 views. The hierarchical view 204 can be represented in various  
10 ways, including by visually showing the hierarchical structure of the electronic-  
11 form template 132, if applicable. One example of this is the indentations of the  
12 hierarchical view 204 set forth in the hierarchical view display area 108 of Fig. 2.

13 The electronic-form template 132 can be represented in various ways. The  
14 user interface 128 can display the design view 202 to make it easy for a designer  
15 to understand the structure of the electronic-form template 132, or can show the  
16 electronic-form template 132 without additional information. The design view  
17 202 of the electronic-form template 132 can mimic an electronic-form  
18 representation of the XML document 134 potentially seen by a user, such as set  
19 forth in the form-design area 112 of Fig. 2. The design view 202 can show  
20 components built into the electronic-form template 132 with additional  
21 information showing details about the data-entry field or fields corresponding to  
22 the components to aid a designer in understanding and altering the components in  
23 the electronic-form template 132.

24 The user interface 128 can also display the hierarchical view 204 in order  
25 for the designer to assess the electronic-form template 132 after each change made

1 by the designer. When the designer can quickly see the effect of his changes, the  
2 designer can more easily build the electronic-form template 132 to match the  
3 designer's intended results. Once the design view 202 is displayed and the  
4 hierarchical view 204 is displayed (if desired) in the hierarchical view display area  
5 108, the designer can continue to make changes or end the process. Ending the  
6 process will be discussed as part of the block 414, described below.

7 Continuing the example above, the design application 126 will build the  
8 electronic-form template 132 based on the identity and placement of the  
9 component.

10 One of the advantages of the design application 126, and the method it  
11 employs, is that the electronic-form template 132 can be built incrementally. That  
12 is to say, with each component chosen, or in some implementations with each  
13 other action taken that will affect a view of the electronic-form template 132, the  
14 electronic-form template 132 is altered. This incrementalism allows a designer to  
15 quickly see how the electronic-form template 132 is changing with each change  
16 made by the designer. The designer does not have to work on either a form or a  
17 schema and then save the form or schema to see how the corresponding schema or  
18 form looks or performs. Instead, as the designer makes a change, it is reflected in  
19 the views of the electronic-form template 132. This makes designing an  
20 electronic-form template 132 easy and intuitive.

21 In one implementation, the design application 126 can reflect each change  
22 made by a designer to both views of the electronic-form template 132 so quickly  
23 that the designer sees it in real time, regardless of whether the change was made to  
24 the electronic-form template 132 by altering the design view 202 or the  
25

1 hierarchical view 204. By so doing, the designer can more easily design  
2 electronic-form templates.

3 With the new change to electronic-form template 132 shown, the design  
4 application 126 continues to enable the designer to add components to the  
5 electronic-form template 132, returning to block 404, or alter an existing  
6 component, block 412.

7 If the designer chooses to add another component, the design application  
8 126 enables him to do so in a manner similar to picking the first component as  
9 described above. The design view 202 Fig. 2 is one view of an electronic-form  
10 template built from many components.

11 Fig. 8 shows an exemplary design screen 800 showing the continued  
12 building of the electronic-form template 132. The design screen 800 shows the  
13 views of the electronic-form template 132 from Figs. 6 and 7, and the results of  
14 the designer continuing to choose components. Through this process of adding  
15 components to the form-design area 112, a designer can build everything from a  
16 simple electronic-form template, such as shown in Fig. 6, to a moderately complex  
17 electronic-form template, such as shown Fig. 8, to a large, complex electronic-  
18 form template, such as shown in Fig. 2.

19 In one embodiment, when a designer adds the repeating section component  
20 320 (shown in Fig. 3 and Fig. 6) to the form-design area 112, the design  
21 application 126 adds the following editability element to the electronic-form  
22 template 132:

23  
24 **<xsf:xmlToEdit name="repeating\_string"**  
25

```
1      item="/myFields/container2/repeating_string"
2      container="/myFields /container2" >
3      <xsf:editWith component="xCollection"/>
4  </xsf:xmlToEdit>
```

6 In this example, the editability element (entitled "xmlToEdit") includes an  
7 attribute having a character string of "item", associated with an indicator of:  
8 "myFields/container2/repeating\_string" (the "value" of the attribute). This  
9 indicator gives a name/location of nodes in the XML document 134 that are  
10 potentially editable. In this example the indicator comprises an XPath expression  
11 being usable to locate (i.e., identify) the nodes.

12 This editability element also comprises a "container" attribute having a  
13 value, in this example, of: "myFields/container2" . This attribute determines a  
14 dynamic contextual condition for being able to edit the potentially editable nodes  
15 indicated by "myFields/container2/repeating\_string". In this implementation they  
16 are editable only if a node matching the XPath expression: "/myFields/container2"  
17 (an ancestor of "myFields/container2/repeating\_string") is shown (or rendered) as  
18 a section within an electronic-form representation of the XML document 134, and  
19 if the user of the editor application has selected a field somewhere within that  
20 section. In this example, the condition is met if the data-entry field is rendered  
21 within the section corresponding to the "myFields/container2" node's. If not, the  
22 editability element does not permit its operations for the potentially editable  
23 node(s).

24 This editability element also contains an operation element entitled  
25 "editWith". This operation element indicates that operations associated with

1 “xCollection” may be applied on or for the nodes indicated by  
2 “myFields/container2/repeating\_string”, if the condition is met.

3 The operation or set of operations indicated by the operation element can be  
4 determined from its syntax. Thus, in the ongoing example the syntax  
5 “xCollection” indicates a certain set of operations, described in part above. The  
6 set indicated by “xCollection” comprises selecting, inserting, deleting, pasting,  
7 and copying the potentially editable nodes (indicated by  
8 “myFields/container2/repeating\_string”) or their subordinate nodes.

9 In the ongoing example, a repeating section 804 is shown in the design  
10 view 202 of the XML document 134. This repeating section 804 comprises data-  
11 entry fields shown at numerals 810, 812, and 814. These data-entry fields  
12 represent the potentially editable nodes for the editability element.

13 The editor application 130 can determine that the three nodes matching the  
14 XPath expression “myFields/container2/repeating\_string” can be edited. Thus, by  
15 following the electronic-form template 132, the editor application 130 can  
16 correctly enable editing according to the “xCollection” syntax of the operation  
17 element. In one implementation, the editor 130 can present the data-entry fields  
18 810, 812, and 814 in an electronic form (e.g., through the user interface 128). The  
19 editor application 130 can also enable permitted operations on these data-entry  
20 fields (and thus their associated nodes of the XML document 134). In this  
21 implementation, the editor application 130 enables selection of and insertion,  
22 deletion, pasting, and copying of the editable nodes associated with the data-entry  
23 fields 810, 812, and 814.

24 Returning to the process 400 of Fig. 4, a designer can simply make a  
25 change, like adding a component, to a view and see the change applied to both



1 views. In this sense, the design view 202 and the hierarchical view 204 are  
2 actively linked. This active linkage makes designing and changing the electronic-  
3 form template 132 quicker, easier, and more intuitive.

4 In the block 412, the design application 126 enables a designer to select and  
5 alter existing components included in the electronic-form template 132. The  
6 design application 126 allows the designer to intuitively and easily alter the views  
7 of the electronic-form template 132, such as by including editing tools familiar to  
8 designers that know word-processing techniques. A designer can change a  
9 component stylistically (such as the font, color, size, and the like) and structurally  
10 (such as by changing a text box to a check box, and whether or to which other  
11 components the component governs or is subordinate). A designer can make these  
12 changes also by altering how a component (such as one displayed as a data-entry  
13 field) is represented on the design view 202. For example, a designer can click on  
14 a component on the form-design screen 112, change the style, move it, delete it,  
15 and the like. As the designer makes changes, the design application 126 alters the  
16 hierarchical view to continue to correspond to the altering electronic-form  
17 template 132 and its design view 202.

18 Fig. 8 shows the exemplary design screen 800, which provides another  
19 example of the design view 202 and the hierarchical view 204 of an example of  
20 the electronic-form template 132. To enable the designer to make changes to a  
21 component, the design application 126 (through the user interface 128) enables the  
22 designer to click on components displayed in the design view 202 of the  
23 electronic-form template 132. One such component, a text box data-entry field  
24 802 (labeled "String 5"), is shown as an example. Once the designer selects a  
25 component, in this example the text box data-entry field 802, the design

1 application 126 provides the designer with multiple options to change the data-  
2 entry field. As seen in a design screen 900 (described below), the design  
3 application 126 provides options in a way comfortable to a designer familiar with  
4 common word-processing techniques and icons. If the designer clicked on the text  
5 box data-entry field 802 of Fig. 8, the design application 126 can provide multiple  
6 pop-up menus of options for the designer.

7 Fig. 9 sets forth the exemplary design screen 900 including multiple ways  
8 in which the design application 126 provides options for a designer. These  
9 comprise a component context menu 902 and a structure submenu 904. In this  
10 example, the design application 126 enables the designer to change the electronic-  
11 form template 132 by changing a representation of a component in the form-  
12 design area 112 (such as a data-entry field or accompanying graphics and text).  
13 Also, the design application 126 enables the designer to cut the component and  
14 move it (through selection and deleting or dragging the component), and change  
15 its font, borders, shading, and other style changes (through the component context  
16 menu 902), as well as change its structure (through the structure submenu 904). In  
17 this example, the designer changes the component by changing the structure of a  
18 data-entry field corresponding to the component (the text box data-entry field 802)  
19 into a date picker data-entry field by selecting a date picker component 906.

20 Fig. 10 shows an example of the hierarchical view display area 108, and  
21 how it can be used by a designer to alter the electronic-form template 132. In this  
22 example, a designer selected an integer node 1002 representing an editability  
23 element of the electronic-form template 132. Once chosen, the design application  
24 126 prompts the designer, asking for information, such as through a change  
25 inquiry window 1004. Using the window 1004, the design application 126 enables

1 the designer to make various changes to the editability element represented by the  
2 node 1002. He can change, for instance, the data type and default value allowed  
3 for this editability element in the electronic-form template 132.

4 Also as part of this example, the design application 126 presents the  
5 designer with the current name, type, and data type of a selected editability  
6 element. The designer can then make changes by altering these current parameters  
7 of a selected editability element, such as set forth in the change inquiry window  
8 1004 by changing the name to "myNewField" from "element" and the data type to  
9 "Text (string)" from "Whole Number (integer)" for the editability element  
10 represented by the node 1002.

11 Fig. 10 shows an example of a pop-up window with which the design  
12 application 126 can enable a designer to alter editability elements. With an alter  
13 window 1006, the designer can add or delete aspects of an editability element,  
14 such as a name and repeatability of an element or establish whether or not it is  
15 allowed to be blank.

16 As part of enabling the designer to makes these changes, the design  
17 application 126 makes appropriate changes to the electronic-form template 132  
18 and its views. If the designer deletes a component, for instance, the design  
19 application 126 may delete the syntax (e.g., the editability element) corresponding  
20 to the component from the electronic-form template 132.

21 According to block 414, when finished, the end product is the electronic-  
22 form template 132. One example of an electronic-form template created by the  
23 design application 126 is the purchase order example of the design view 202 of  
24 Fig. 2. This purchase order electronic-form template 132 can be used by the editor  
25 application 130 to present an electronic-form representation of the XML document

1 134 with appropriate permitted operations. The editor application 130 can enable  
2 this electronic-form representation to be edited by an end user, such as by allowing  
3 that user to perform an operation like keying in information into some of the data-  
4 entry fields. After entry of information, the information can be stored in the XML  
5 document 134.

6 The information stored can conform to the electronic-form template 132,  
7 thereby allowing easy use and/or transfer of information stored in the XML  
8 document 134. The electronic-form template 132 can be written in various  
9 languages, including schemas written to govern markup languages (such as XML).  
10 Schemas governing XML documents are commonly called XML Schemas, DTD  
11 (Document Type Definition) schemas, and XDR (XML-Data Reduced) schemas.

12 The electronic-form template 132 can govern many different documents.  
13 Because of this, the electronic-form template 132 can be used to enable thousands  
14 of different users keying information into thousands of different documents, all of  
15 which can be governed by the electronic-form template 132.

#### 16 17 *More on Editing XML Documents*

18 As discussed in part above, the electronic-form template 132 comprises  
19 information by which an application can determine which nodes of an XML  
20 document are editable and in what manner. The editor application 130 of Fig. 1 is  
21 described above as one embodiment of an application that can use the electronic-  
22 form template 132 to aid in editing XML documents. Here the XML document  
23 134 is assumed associated with the electronic-form template 132. This association  
24 can be determined in various manners, such as by reading text in the XML  
25 document 134 indicating a relationship with the electronic-form template 132.

1        Fig. 11 shows a process 1100 for editing the XML document 134. As part  
2 of this editing, the editor application 130 uses the electronic-form template 132 to  
3 determine which nodes of the XML document 134 are editable. The electronic-  
4 form template 132 can also aid the editor application 130 in determining in what  
5 way those nodes are editable.

6        At block 1102, the editor application 130 determines, using the electronic-  
7 form template 132, that a node of the XML document 134 is potentially editable.  
8 The editor application 130 can do so by reading and analyzing editability elements  
9 in the electronic-form template 132.

10       In one embodiment of the electronic-form template 132, the editability  
11 element comprises an indicator with a character string of "xmlToEdit". This  
12 string indicates that a node or nodes associated with the indicator are editable (or  
13 potentially editable). This editability element also comprises an "item" attribute,  
14 which is usable to identify which nodes are editable. An XPath expression  
15 identifying the editable nodes is associated with this attribute (the "value" of the  
16 attribute). Thus, the editor application 130 can use the XPath expression in the  
17 editability element to determine which nodes of the XML document 134 are  
18 editable.

19       For example, if the electronic-form template 132 comprises the following  
20 editability element:

21  
22        **<xf:xmlToEdit name="Order"**  
23                **item="/Document/Orders/Order" container="/Document" >**  
24                **<xf:editWith component="xCollection"/>**  
25        **</xf:xmlToEdit>**

1  
2 then the "xmlToEdit" editability element includes an "item" attribute, whose  
3 "value" is an XPath expression "/Document/Orders/Order". This XPath  
4 expression indicates to the editor application 130 that nodes in the XML document  
5 134 that match this expression are editable (or potentially editable).

6 At block 1104, with the node or nodes of the XML document 134  
7 identified, the editor application 130 presents data of the editable node. The editor  
8 application 130 can present this data using an electronic-form representation of the  
9 XML document 134 and/or the editable node. The editor application 130 can do  
10 so with aid from the user interface 128 or otherwise.

11 Fig. 12 shows an example of an electronic-form representation 1200 of the  
12 editable node. Here the editor application 130 presents the data of the editable  
13 node as an order data-entry field 1202. As shown, a data-entry field presenting  
14 data of an editable node can be blank, such as when no information has been  
15 entered into the data-entry field. A data-entry field can also include information  
16 previously stored in the editable node, which in some cases can be edited,  
17 depending on what operations are permitted for the editable node.

18 At block 1106, the editor application 130 determines what operations are  
19 permitted to be performed on the editable node. This determination can be  
20 performed by the editor application 130 prior to presenting the data of the editable  
21 node. In some cases determining the operations permitted can affect how data is  
22 presented. The editor application 130 determines the permitted operations based  
23 on an operation element of the electronic-form template 132, discussed in part  
24 above. The operation element and the editability element are associated, such as  
25 by the operation element being a child element to the editability element. The

operation element indicates operations permitted to be performed on the editable node.

In the ongoing example,

```
<xsf:xmlToEdit name="Order"  
    item="/Document/Orders/Order"  
    container="/Document" >  
    <xsf:editWith component="xCollection"/>  
</xsf:xmlToEdit>
```

the operation element comprises a character string of "editWith". This character string indicates to the editor application 130 that the operation element indicates certain types of operations that are permitted. Following this character string, another character string of "component" is included. This character string can indicate that a value associated with the "component" string that is usable to determine permitted operations.

In the ongoing example, the operation element comprises an operational syntax of "xCollection". This syntax indicates the operations permitted to be performed on nodes of the XML document 134 matching the XPath expression "/Document/Orders/Order".

The editor application 130 can determine the operations associated with this syntax in various ways. The editor application 130 can use this syntax to locate executable code for this operation. In one embodiment of the electronic-form template 132, executable code for operations indicated by various syntaxes are included within the editor application 130.

1 At block 1108, the editor application 130 enables the permitted operations.  
2 The editor application 130 can do so by supplying a user interface appropriate for  
3 the permitted operations. For data alteration or addition, the editor application 130  
4 can provide a word-processor-like experience in a data-entry field. Like shown in  
5 Fig. 12, the order data-entry field 1202 can be used as a user interface to enter  
6 data, delete data, copy and paste data, and the like. Thus, the editor application  
7 130, by determining editable nodes and permitted operations for them, can enable  
8 certain types of editing for various editable nodes of the XML document 134.

9 At block 1110, the editor application 130 receives a selection of an enabled  
10 operation. Continuing the ongoing example, the editor application 130 can receive  
11 entry of "ACME Tire Company" into the order data-entry field 1202.

12 At block 1112, the editor application 130 alters data in the editable node (or  
13 the editable node itself or associated nodes) of XML document 134 by performing  
14 the selected operation. For the ongoing example, the editor application 130 can  
15 receive the text "ACME Tire Company" and alter data within the order node to  
16 reflect this text. Thus, the editor application 130 can add the text "ACME Tire  
17 Company" to the order node.

#### 18 19 Other Permitted Operations

20 The electronic-form template 132 can permit many different types of  
21 operations. These comprise, for instance, operations mentioned above and those  
22 described below.

23 The editor application 130 can use the electronic-form template 132 to  
24 determine what operations are permitted. With this determination, the editor  
25 application 130 can enable permitted operations.



For example, for an editability element of:

```
<xsf:xmlToEdit name="workItem" item="workItems/workItem"
  container="workItems">
  <xsf:editWith component="xCollection" >
    <xsf:fragmentToInsert>
      <xsf:chooseFragment>
        <workItem description="create visuals"></workItem>
      </xsf:chooseFragment>
    </xsf:fragmentToInsert>
  </xsf:editWith>
</xsf:xmlToEdit>
```

The editor application 130 can determine that the electronic-form template 132, for the node(s) indicated by “workItems/workItem”, permits an operation of inserting nodes adjacent to this “workItem” node (or under the node corresponding to the container attribute: “workItems”). In this example, the operation element comprises a syntax of “xCollection”, which indicates a permitted operation of inserting or deleting subnodes adjacent to the editable node indicated by “workItems/workItem”.

This operation, however, is conditional based on a context element (here an attribute of the editability element). This context is given by a value for a “container” attribute. Here, the container attribute’s value is given by a syntax “workItems”. This syntax comprises a XPath expression. Thus, the editor application 130 can determine, based on the syntax given, that operations are not

1 permitted unless a node locatable with the XPath expression “workItems” is  
2 exposed. The editor application 130 can determine if the “workItems” node (the  
3 parent of the “workItems/workItem” node) is exposed, if a section associated with  
4 it is exposed in an electronic-form rendering of the “workItems” node. If the  
5 editor application 130 is rendering the XML document 134, the editor application  
6 130 can determine if the “workItems” node is exposed by checking whether it or  
7 its user interface has exposed the node.

8 Additional information useful in performing operations can also be  
9 included in the electronic-form template 132. For the example immediately  
10 above, syntax can also be included in the operation element to indicate what data  
11 is to be inserted in the XML document by the operations. This syntax comprises a  
12 “fragmentToInsert” child element to the editability element. Using this  
13 information, the editor application 130 can determine that a child element of the  
14 fragmentToInsert element contains the data to be inserted.

15 In this example, a child element having a character string of  
16 “chooseFragment” indicates that new XML content corresponding to the XML  
17 markup: “<workItem description=“create visuals”></workItem> “ can be inserted  
18 next to the “workItem” node.

19 In a similar way, the electronic-form template 132 editability element  
20 provides syntax permitting deletion of the editable node or nodes using the syntax  
21 of “xCollection”.

22 Also by way of example, for an editability element of:

23  
24 **<xsf:xmlToEdit name="author" item="issue/@author "**  
25 **container="issue">**

```

1      <xsf:editWith component="xOptional">
2          <xsf:fragmentToInsert>
3              <xsf:chooseFragment>
4                  <xsf:attributeData attribute="author" value="author
5                      name"/>
6              </xsf:chooseFragment>
7          </xsf:fragmentToInsert>
8      </xsf:editWith>
9  </xsf:xmlToEdit>

```

a node or nodes located with the XPath expression of “item/@author” has a permitted operation associated with the syntax “xOptional”. This operation element comprises a character string of “editWith” and “component”. The syntax following “component” (i.e., “xOptional”) can be used by the editor application 130 to determine operations permitted for the editable node(s) indicated by the XPath expression “item/@author”.

Like above, this operation, however, is conditional based on a context element (here an attribute of the editability element). This context is given by the value of the “container” attribute, in this case: “issue”.

For the example immediately above, a syntax “fragmentToInsert” can be used by the editor application 130 to determine where and what to insert. Thus, the character string of “chooseFragment” indicates that an “author” attribute node having an value: “author name” is permitted to be added to the “issue” node.

Unlike the operation element having a syntax of “xCollection”, the operation element corresponding to an “editWith” element whose “component”

1 attribute value has the value “xOptional”, permits addition of only one node. It  
2 also permits that node (locatable with “item/@author”) to then be deleted.

3 In another embodiment of the operation element, an attribute of the  
4 operation element indicates textual operations permitted on data of the editable  
5 node. This indication corresponds to an “editWith” element whose “component”  
6 attribute value has the value “xField”, indicating that textual operations are  
7 permitted. Various types of textual operations may also be included in the  
8 electronic-form template 132.

9 For example, for an editability element of:

10  
11 **<xsf:xmlToEdit item="description/textItem">**  
12 **<xsf:editWith component="xField" type="rich" />**  
13 **</xsf:xmlToEdit>**  
14

15 a node or nodes located with the XPath expression of “description/textItem” has a  
16 permitted operation specified by “editWith” and “component”. A value of  
17 “component”, here “xField”, can be used to indicate that textual editing of data of  
18 the editable node is permitted. A value of “type”, here “rich”, can be used to  
19 indicate that rich-text editing is permitted. Thus, the syntax following  
20 “component” of “xField” and “rich” can be used by the editor application 130 to  
21 determine that rich-text editing of data of the editable node(s) indicated by the  
22 XPath expression “item/@author” is permitted.

23 In another embodiment of the “xField” operation element above, a type  
24 attribute given by a syntax “plain” indicates that an operation for creation and  
25

modification of plain-text-data (but not rich-text-formatted data) of the editable node is permitted.

Fig. 13, for example, shows an electronic-form representation 1300 of an example of the XML document 134. Here many different nodes are presented and operations enabled. For instance, the electronic form 1300 shows data-entry fields enabling plain-text operations to be performed, referenced at numerals 1302 and 1304. It also shows enabling of other operations: a repeating table shown at numeral 1306; a bulleted list at 1308; and an optional section at 1310. Editability elements for these enabled operations can be represented in the electronic-form template 132 with:

```
<xsf:xmlToEdit                                     name="term_115"
item="/po:Document/po:terms/po:term" >
  <xsf:editWith component="xTextList"/>
</xsf:xmlToEdit>
<xsf:editWith caption="notes" component="xOptional" >
  <xsf:fragmentToInsert>
    <xsf:chooseFragment>
      <po:notes/>
    </xsf:chooseFragment>
  </xsf:fragmentToInsert>
</xsf:editWith>
```

## A Computer System

Fig. 14 shows an exemplary computer system that can be used to implement the processes described herein. Computer 1442 comprises one or more processors or processing units 1444, a system memory 1446, and a bus 1448 that couples various system components including the system memory 1446 to processors 1444. The bus 1448 represents one or more of any of several types of bus structures, including a memory bus or memory controller, a peripheral bus, an accelerated graphics port, and a processor or local bus using any of a variety of bus architectures. The system memory 1446 comprises read only memory (ROM) 1450 and random access memory (RAM) 1452. A basic input/output system (BIOS) 1454, containing the basic routines that help to transfer information between elements within computer 1442, such as during start-up, is stored in ROM 1450.

Computer 1442 further comprises a hard disk drive 1456 for reading from and writing to a hard disk (not shown), a magnetic disk drive 1458 for reading from and writing to a removable magnetic disk 1460, and an optical disk drive 1462 for reading from or writing to a removable optical disk 1464 such as a CD ROM or other optical media. The hard disk drive 1456, magnetic disk drive 1458, and optical disk drive 1462 are connected to the bus 1448 by an SCSI interface 1466 or some other appropriate interface. The drives and their associated computer-readable media provide nonvolatile storage of computer-readable instructions, data structures, program modules and other data for computer 1442. Although the exemplary environment described herein employs a hard disk, a removable magnetic disk 1460 and a removable optical disk 1464, it should be appreciated by those skilled in the art that other types of computer-readable media

1 which can store data that is accessible by a computer, such as magnetic cassettes,  
2 flash memory cards, digital video disks, random access memories (RAMs), read  
3 only memories (ROMs), and the like, may also be used in the exemplary operating  
4 environment.

5 A number of program modules may be stored on the hard disk 1456,  
6 magnetic disk 1460, optical disk 1464, ROM 1450, or RAM 1452, including an  
7 operating system 1470, one or more application programs 1472 (such as the design  
8 application 126 and the editor application 130), other program modules 1474, and  
9 program data 1476. A user may enter commands and information into computer  
10 1442 through input devices such as a keyboard 1478 and a pointing device 1480.  
11 Other input devices (not shown) may comprise a microphone, joystick, game pad,  
12 satellite dish, scanner, or the like. These and other input devices are connected to  
13 the processing unit 1444 through an interface 1482 that is coupled to the bus 1448.  
14 A monitor 1484 or other type of display device is also connected to the bus 1448  
15 via an interface, such as a video adapter 1486. In addition to the monitor, personal  
16 computers typically comprise other peripheral output devices (not shown) such as  
17 speakers and printers.

18 Computer 1442 commonly operates in a networked environment using  
19 logical connections to one or more remote computers, such as a remote computer  
20 1488. The remote computer 1488 may be another personal computer, a server, a  
21 router, a network PC, a peer device or other common network node, and typically  
22 comprises many or all of the elements described above relative to computer 1442.  
23 The logical connections depicted in Fig. 14 comprise a local area network (LAN)  
24 1490 and a wide area network (WAN) 1492. Such networking environments are  
25

1 commonplace in offices, enterprise-wide computer networks, intranets, and the  
2 Internet.

3 When used in a LAN networking environment, computer 1442 is connected  
4 to the local network through a network interface or adapter 1494. When used in a  
5 WAN networking environment, computer 1442 typically comprises a modem 1496  
6 or other means for establishing communications over the wide area network 1492,  
7 such as the Internet. The modem 1496, which may be internal or external, is  
8 connected to the bus 1448 via a serial port interface 1468. In a networked  
9 environment, program modules depicted relative to the personal computer 1442, or  
10 portions thereof, may be stored in the remote memory storage device. It will be  
11 appreciated that the network connections shown are exemplary and other means of  
12 establishing a communications link between the computers may be used.

13 Generally, the data processors of computer 1442 are programmed by means  
14 of instructions stored at different times in the various computer-readable storage  
15 media of the computer. Programs and operating systems are typically distributed,  
16 for example, on floppy disks or CD-ROMs. From there, they are installed or  
17 loaded into the secondary memory of a computer. At execution, they are loaded at  
18 least partially into the computer's primary electronic memory. The system  
19 described herein comprises these and other various types of computer-readable  
20 storage media when such media contain instructions or programs for implementing  
21 the blocks described, in conjunction with a microprocessor or other data processor.  
22 The system described can also comprise the computer itself when programmed  
23 according to the methods and techniques described herein.

24 For purposes of illustration, programs and other executable program  
25 components such as the operating system are illustrated herein as discrete blocks,



1 although it is recognized that such programs and components reside at various  
2 times in different storage components of the computer, and are executed by the  
3 data processor(s) of the computer.

#### 4 5 Conclusion

6 The above-described system and method enables an end user to edit an  
7 XML document in ways permitted by an electronic-form template. Although the  
8 system and method has been described in language specific to structural features  
9 and/or methodological acts, it is to be understood that the system and method  
10 defined in the appended claims is not necessarily limited to the specific features or  
11 acts described. Rather, the specific features and acts are disclosed as exemplary  
12 forms of implementing the claimed system and method.

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